Census of terns and other colonial waterbirds in Prince Edward Island - 1999

Andrew W. Boyne, Dedreic Grecian and Jason Hudson

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CENSUS OF TERNS AND OTHER COLONIAL WATERBIRDS IN PRINCE EDWARD ISLAND - 1999

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INTRODUCTION

The islands, coastal sandspits, and barrier beaches of Prince Edward Island provide nesting habitat for colonial waterbirds including Common Terns (*Sterna hirundo*), Arctic Terns (*S. paradisaea*), Great Black-backed Gulls (*Larus marinus*), Herring Gulls (*L. argentatus*), Ring-billed Gulls (*L. delawarensis*), Double-crested Cormorants (*Phalacrocorax auritus*), Great Cormorants (*P. carbo*), Great Blue Herons (*Ardea herodias*), and Black Guillemots (*Cepphus grylle*). There have been several efforts to survey these colonies in the last 40 years, the last of which occurred in 1987 (Vass 1965; Pigot 1967; MacDougall 1985; Lock 1987; Lock 1988; Northcott and Creamer 1987).

It has been suggested that there has been a change in the abundance and distribution of colonial waterbirds in Prince Edward Island since the mid-1980s when the last surveys were conducted (Northcott and Creamer 1987). Although dedicated tern surveys have not been conducted in a number of years, opportunistic observations indicate that the number of nesting terns has decreased at some traditional colony sites (e.g. Hillsborough Bridge), while others have been abandoned altogether (e.g. Cascumpec Sandhills). Declines in tern populations are suspected throughout Atlantic Canada (Chardine et al. 1999; Nettleship 1997; Canadian Wildlife Service 1992; Erskine 1992). Terns are threatened by increasing human disturbance and development in the coastal zone, and gull populations which have been augmented through interactions with humans (i.e. increased access to artificial food sources). Increased gull populations out-compete terns for preferred nesting sites and actively prey on their eggs and chicks.

In 1996, as a result of these threats and suspected declines, a report on the status of the Common Tern in Canada was prepared for the Committee On the Status of Endangered Wildlife in Canada (COSEWIC; James and Harris 1996). The report recommended that the species be listed as *Not at Risk* because Common Terns were deemed to be adaptable, widespread, and relatively abundant. There was a lack of current data to support the claims of declining populations in eastern Canada. An annex to the status report was prepared (P. Mills, Nova Scotia Department of Natural Resources, unpublished report) to provide more information from Eastern Canada, however in 1998 the species was listed by COSEWIC as *Not at Risk*. There was a level of discomfort with this designation within Atlantic Canada, although it was acknowledged that more data were required to properly establish population trends for the region. In response to this need, the Canadian Wildlife Service - Atlantic Region, with its partners, initiated a program in 1999 to survey terns in Atlantic Canada over a 4-5 year period.

This report outlines the results of tern surveys conducted on Prince Edward Island in 1999. This census was designed primarily for marine terns, although the opportunity was taken to survey all coastal waterbirds.

METHODS

Both aerial and ground surveys were timed to occur during the third week after the peak egg-laying period for terns. Aerial surveys provided an effective and efficient method of identifying waterbird colonies along the entire coastline of the province, allowed photographs to be taken of gull, cormorant and heron colonies, and permitted estimates of roosting flocks of waterbirds observed away from colonies. Ground surveys provided accurate counts of tern nests.

Aerial surveys of the coast of Prince Edward Island were conducted from a fixed-wing aircraft (Cessna 172; Moncton Flight College; pilot: Derek Flynn), 11-12 June, 1999. Surveys were conducted 50 m offshore at an altitude of approximately 500 m. On 11 June, the coast was flown from Borden clockwise to North Rustico (observers: A. W. Boyne and A. R. Lock) and the remainder of the coastline was surveyed on 12 June beginning at Rustico Island and finishing at Borden (observers: A. W. Boyne and D. L. Amirault). Surveys lasted from 9:50 until 12:50 on 11 June and 10:00 to 13:10 on 12 June (total survey time: 8.17 hours). Flights originated in Moncton, requiring an additional 2.75 hours of ferrying time. The locations of colonial waterbird breeding colonies and roosting flocks were recorded on a 1:250,000 topographic map during the flight.

In an attempt to flush incubating terns at historical nesting colonies, at sites where terns were noted flying nearby, and at sites that appeared to be particularly suitable for nesting terns, the altitude of the plane was dropped to between 150-200 m. If birds were seen, an attempt was made to estimate the total number terns flushed from the colony. The actual number of terns was counted at smaller colonies, but at larger colonies the number of birds over the site was estimated by counting the number of groups of 5 or 10 birds, depending on the size of the flock.

Ground surveys were generally conducted by two researchers (A. W. Boyne and D. Grecian) 14-15 June, 1999 although, information from some colonies was provided by Prince Edward Island National Park (PEINP) and the Island Nature Trust. Upon entering a colony, we estimated the total number of terns flushed from each site as was done during the aerial survey, and actively looked for Arctic Terns amongst the vastly more abundant Common Terns. The number of nests with eggs and the number of eggs in each nest was determined by walking transects through the entire colony, marking every nest observed with a coffee stir stick to prevent double counting. Empty nests were not included in the total number because of the difficulty interpreting why a nest was empty. An empty nest may be a preliminary scrape created by a pair before they selected a final nest site; an active nest where eggs have not yet been laid; or a formerly active nest that has lost its eggs through a depredation, flooding, or other event. Information such as the number of broken eggs in a colony, the timing of the survey, and the number of terns flying over a colony, together with data on empty nests, was used to make assumptions about the recent history of a colony.

Gull, cormorant, and heron colonies were not visited during ground surveys as the surveys were conducted when these species would have had chicks; disturbance would have been too great and the census inaccurate. Gull, cormorant, and heron colonies were photographed during the aerial survey with a Pentax 6x7 medium format camera using Kodak T-MAX 100 and 400 black-and-white film at an altitude of approximately 600 m. Negatives were enlarged to 8" x 10" prints. The location of colonies was marked on a 1:250,000 topographic map. The number of gulls, cormorants, and herons suspected to be sitting on nests was counted by poking a pin through each bird on the photograph and counting the holes on the back with a marker. Those sections of photographs that overlapped areas on adjacent photographs were marked directly on the prints and only the image that best represented the overlapped area was counted. Only birds in vegetation or that appeared to be sitting on a nest were counted, those on shorelines or in large roosts were ignored. Not all cormorant colonies were photographed because the Prince Edward Island Department of Fisheries, Aquaculture and Environment, Fish and Wildlife Division surveys all known cormorant colonies annually (R. Dibblee, personal communication).

The location and number of gulls and cormorants in roosting flocks was recorded according to CWS Coastal Survey Block (Hicklin and Barrow 1996; Figure 1).

Results from this survey are archived in the Atlantic Region Seabird Colony Database, Canadian Wildlife Service, Sackville, N.B..

RESULTS

Terns - Only three tern colonies were identified during the aerial survey (Indian Point Sandhills East; Pownal Bay, Jobs Point; and Eglington Cove), however ground surveys confirmed breeding terns at nine sites on Prince Edward Island in 1999 (Table 1 and 2; Figure 2). The Hillsborough Bridge colony was not surveyed by air because of its proximity to Charlottetown airport and four other colonies had ≤12 nests which would have made detection from the air difficult. The only colony larger than 12 pairs that was missed during the aerial survey was on Cavendish Sandspit. Over 80% of the 287 nests with eggs were located at three sites (Pownal Bay, 113 nests; Cavendish Sandspit, 68 nests; and Indian Point Sandhills East, 54 nests). Common Terns accounted for all nests except for single Arctic Tern nests at Cavendish Sandspit and Covehead Bridge (McIntyre 1999). The mean clutch size of colonies with more than 10 nests varied from 1.33 - 2.58 eggs per nest (Table 2).

Predation was evident at Eglington Cove and Indian Point Sandhills East. At the Eglington Cove colony, 17 broken eggs were found and only 15 of 32 nests had eggs, while at Indian Point Sandhills East only 54 of 91 nests had eggs but 160 adults were counted over the colony. Because there were no subsequent surveys, it is not known whether some of these early failures re-nested. Predation was also a factor in PEINP, where 18 of the 24 lost nests at Cavendish whose fate were known were depredated by either red foxes *Vulpes vulpes* (10) or an unknown predator (8), and the single nest at

Blooming Point was also lost to red fox predation (McIntyre 1999). The cause of the complete hatching failure of the 12 nests at Covehead was unknown (McIntyre 1999). An extreme high tide during our census at Pownal Bay flooded 106 of 113 nests, in some cases under 30 cm or more of water. This colony was located on Jobs Point, a low-lying grassy peninsula attached to the mainland, which is very susceptible to flooding.

Gulls - Nine gull colonies were observed and photographed during the aerial surveys, and a tenth colony (Hillsborough Bridge) was surveyed from the ground with a spotting scope. Problems with the camera caused difficulties estimating the number of gulls nesting at some colonies. The camera did not consistently advance the film properly causing overlapped negatives for Alberton Harbour, Cascumpec Sandhills, Little Courtin Island, Ram Island, and Poverty Beach. Additional negatives from Poverty Beach were ruined during development. In total 1879 nesting pairs of Great Black-backed and Herring Gulls were counted on the aerial photographs (Table 3). Because of the poor quality of the images it was not possible to distinguish between Herring and Great Black-backed Gulls from the aerial photographs. Ring-billed Gulls were distinguishable because their nests tend to be more closely and regularly spaced than those of the larger species (Lock 1988). Ring-billed Gulls were noted at two colonies, where 497 pairs were counted (Table 3). A total of 5484 roosting gulls were surveyed away from colonies (Table 4, Figure 3). Interestingly, roughly 100 Bonaparte's Gulls (*L. philadelphia*) were observed in Eglington Cove. Ground surveys confirmed that the majority of birds were in basic or juvenile plumage. This species stages in the province in late summer (Hogan 1991) but this observation is earlier than expected.

Cormorants - Nineteen cormorant colonies were noted during the aerial survey (Figure 4), of which six were photographed. We compared the results from analyses of the aerial photographs to ground estimates from the PEI Fish and Wildlife Division and found that for tree-nesting Double-crested Cormorant colonies, aerial estimates vastly underestimated the number of nests (e.g. Governor's Island: aerial estimate - 636 nests, ground estimate - 1610 nests [R. Dibblee, personal communication]). The photographs may have been taken from too high an altitude making it difficult to see individual nests, and as with the gull photos there were overlapped negatives. Rather than present erroneous data that has already been collected more accurately by the PEI Fish and Wildlife Division, we have chosen not to present colony estimates for cormorants, although we did count 1993 roosting cormorants during the survey (Figure 4). We did not differentiate between Great Cormorant, Double-crested Cormorant, or mixed colonies, as this had also previously been done by the PEI Fish and Wildlife Division.

Great Blue Herons - Great Blue Heron colonies were photographed on Governor's Island and Oulton's Island (Figure 5); 240 nests were estimated on Oulton's Island and 292 nests were estimated on Governor's Island. This was not a complete survey of heronries in the province as there are known inland colonies which we did not survey. The negatives from Governor's and Oulton's Islands were not overlapped and Great Blue Heron nests are considerably larger and more obvious than cormorant nests. Thus, the

difficulties associated with estimating numbers of nesting cormorants were not a problem when identifying Great Blue Heron nests.

DISCUSSION

The number of terns nesting on PEI has decreased dramatically since the mid-1980s when over 3000 pairs nested in the province. The number of colonies has remained relatively stable, however the distribution has not, as only one of the six largest colonies from 1984 still supported nesting terns in 1999. Predation and availability of suitable habitat are the most likely factors limiting the tern population in PEI. Predation affected productivity at Eglington Harbour, Indian Point Sandhills East, and at sites in PEINP, however it is worth noting that the largest tern populations in the province occurred in 1984, when gull populations were much larger than in 1999. Of the nine nesting sites used by terns in 1999, only the Hillsborough Bridge site was not attached to the mainland, whereas in 1984, four of the largest six colonies were on islands. In 2000 and 2001, terns nested on top of a large oil holding tank in Charlottetown, providing additional evidence that suitable natural sites are becoming more rare as human activity increases in the coastal zone. Furthermore, terns still must compete with gulls for those suitable sites that remain.

Our results suggest that the populations of Great Black-backed and Herring Gulls have declined in PEI since 1986. However, this conclusion should be taken with some caution. Surveys in 1986 were conducted 27-28 May, 15 days earlier than in 1999. In 1986, some Great Black-backed Gull nests already contained chicks on 27 May. In 1999, when photos were not taken until 11-12 June, the proportion of hatched nests would have been higher and the chicks would have been older. Therefore the chance that nests were overlooked during aerial surveys would have been higher in 1999 because adult nest attendance declines as the food requirements of older chicks increases. Furthermore, the problems with overlapped negatives may have caused further underestimates of nesting gulls. Despite the fact that we likely underestimated nesting gulls in 1999, the magnitude of the decline seems so great, that we still feel the gull population has decreased since 1986. Although we acknowledge we may have overestimated the extent of the decline.

Fewer than half the number of roosting gulls were censused away from colonies in 1999 as compared to 1986. During the same period, the ratio of gull nests to roosting gulls increased from 1:1.3 to 1:2.9, implying that the proportion of the population that is not breeding had increased, at the same time as the overall population had decreased. The 1999 ratio may be skewed because of the likelihood that the number of nesting gulls was underestimated (see above) but we would have had to underestimated the population by over 60% to get a ratio equivalent to that found in 1986. As conditions for breeding deteriorate, the number of birds that choose not to breed increases before an overall decline in the population occurs (see Cairns 1987). In the case of large gulls in PEI, the decline in breeders is mirrored by a decline in non-breeders so the entire population has declined.

Despite decreased numbers of large gulls, they still vastly outnumber terns in the province. This is a shift from the middle of the last century when Vass (1965) noted that between 1952 and 1965 Common Terns were as numerous as gulls, despite the fact that he had observed increases in Great Black-backed Gulls and considered Herring Gulls a very common permanent resident. Great Black-backed Gulls have been increasing in eastern Canada, whereas Herring Gulls are declining (Chapdelaine 1995, Chapdelaine and Brousseau 1992, Hebert 1989). In the Bay of Fundy, between 1979 and 1998, numbers of breeding Great Black-backed Gulls increased by 2.5 times while Herring Gulls decreased by half (see Mawhinney et al. 1999). Like many seabirds, gulls presumably suffered from human persecution prior to the Migratory Bird Convention Act (1917) but generally flourished following its enactment (Drury 1973 and 1974). Recent declines in Herring Gulls have been attributed to decreases in access to fish offal as a result of modernized fishing techniques and fisheries closures (Chapdelaine and Rail 1997), as well as cleaner operations at waste disposal sites which have decreased the availability and abundance of artificial food sources.

The number of Ring-billed Gulls breeding in PEI more than doubled between 1986 and 1999. This corresponds to a mean annual population growth of 6%, which is lower than the 21% annual increase observed in the Maritime provinces between 1972 and 1986 (Lock 1988). Population growth in the Great Lakes increased after 1960, resulting in the species expanding down the St. Lawrence River, and into the southern Gulf of St. Lawrence where they were first recorded nesting in New Brunswick in 1965 (H. Chiasson, Maritime Nest Record Scheme [MNRS], Canadian Wildlife Service, Sackville, N.B.). The first Ring-billed Gull nests in PEI were noted in 1975 when 5 pairs were observed in Murray Harbour (G. Hogan, MNRS). Since their arrival, Ring-billed Gulls have been noted at three colonies in PEI. The colony on the Cascumpec Sandhills has been abandoned since 1986, the colony in Murray Harbour has been stable since 1986, while the colony on Indian Point Sandhills West has almost quintupled during this period.

Although habitat loss from human development, and predation from gulls and land-based predators such as foxes and coyotes, have been blamed for the declines in tern populations in PEI, there have been no direct studies to support these hypotheses. The plight of terns in the province is critical. The population has declined by more than two-thirds since 1986 and by over 90% since 1984. The three colonies that supported over 80% of the population in 1999 were plagued by flooding and predation. Conservation efforts should be implemented immediately to provide colony sites with better protection from human disturbance and predators, but these should be undertaken in conjunction with research to better understand the factors that are driving the population decline, so that threats can be mitigated through appropriate management strategies.

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Table 1: Numbers and clutch sizes of Common Tern nests censused in Prince Edward Island, 1999.

Location	Latitude	Longitude	Date	Number of eggs				Total nests with eggs	Total eggs	Mean clutch size
				0	1	2	3			
Indian Point Sandhills West	46.63	-64.23	14 June	37	8	21	25	54	125	2.31
Hillsborough Bridge	46.24	-63.10	15 June					17		
Pownal Bay	46.18	-62.98	15 June	2	16	16	81	113	291	2.58
Eglington Cove	46.32	-62.37	15 June	17	11	3	1	15	20	1.33
Cavendish Sandspit[1]	46.50	-63.43	31 May - 4 Aug		16	24	28	68*	148	2.18
Covehead Bridge[1]	46.42	-63.13	29 May					12*		
Rustico Island Sandspit[1]	46.44	-63.25	5 June				1	1	3	3.00
Blooming Point[1]	46.39	-62.98	17 June			1		1	2	2.00
South Lake[2]	46.42	-62.04	18 June					6		
Totals				56	51	65	136	287	589	2.34

* includes one Arctic Tern nest

[1] MacIntyre 1999; [2] J. Waddell, Island Nature Trust, personal communication

Table 2: Censuses of tern nests in Prince Edward Island, 1966-1999. A '-' indicates a colony was not surveyed, '0' means a colony was surveyed and no tern nests were observed, and a blank cell indicates that it was not possible to determine whether an island was surveyed or not.

Colony	1966 [1]	1975 [2]	1984 [3]	1986 [4]	1987 [5]	1999
Alberton Harbour Islands	410	100	474	18	0	0
Boughton Island			-	0	12	0
Cascumpec Sandhills		100	983	136	155	0
Charlottetown Harbour	80		-	0	-	0
Conway Sandhills		0	1189	0	57	0
Darnely Island		50	-	0	-	0
Eglington Cove			-	0	-	15
Hillsborough Bridge	80	125	-	234	231	17
Indian Point Sandhills			355	0	178	54
Little Courtin Island	541	70	0	0	-	0
Malpeque Sandhills, Hog Island			161	0	33	0
Mossy Point			3	0	-	0
Murray Harbour Islands	90	200	-	0	0	0
PEINP, Blooming Point			0	0	-	1
PEINP, Cavendish Sandspit		12	161	0	-	68
PEINP, Covehead Harbour		56	5	0	-	12
PEINP, Rustico Causeway			62	0	-	0
PEINP, Rustico Island Sandspit	1		5	0	-	1
Pownal Bay	98	35	-	21	81	113
Poverty Beach		50	-	21	81	0
Savage Harbour	1		-	0	1	0
South Lake			-	0	2	6
St. Peter's Bay			-	2	0	0
St. Peter's Lake	24		-	0	-	0
Wood Island	1	75	-	4	61	0
Additional colonies	40 *					
Total	1366	873	3398	436	892	287
Number of colonies	29	11	10	7	11	9

[1]B. C. Pigot, Maritimes Nest Record Scheme, Canadian Wildlife Service, Sackville, N.B.; [2]G. Hogan, PEI Fish and Wildlife Division, MNRS; [3]MacDougall 1985; [4]Lock 1987; [5]Northcott and Creamer 1987

*40 nests were observed at 19 additional sites

Table 3: Numbers of Herring Gull, Great Black-backed Gull, and Ring-billed Gull nests surveyed at colonies in Prince Edward Island, 1975 - 1999.

Colony	Herring Gulls				Great Black-backed Gulls				Ring-billed Gulls			
	1975[1]	1984[2]	1986[3]	1999*	1975	1984	1986	1999	1975	1984	1986	1999
Alberton Harbour Islands					50							
Bernards Island				44		136	149					
Tern Island				30		2	11					
Wagners Island				53		35	30					
Gillis Island						1						
Gull Island (Sandy Is.)						111	90					
Murray Harbour												
Cherry Island	70		766	63	40		327					
Gordons Island			2									
Poverty Beach			2200	455			531				114	92
Sable Point Island	250				200				5			
Bird Island		17*					6					
Cascumpec Sand Hills		1341*	1412	384			157			159		
Pownal Bay					20		1					
Conway Sand Hills		108*	46				2					
Hillsborough Bridge							2	2				
Indian Point Sandhills		616	1263	605		617	146			75	116	405
Malpeque Bay												
Little Courtin Island	300	2001*	1430	128	200		571					
Ram Island	200	325*	25	115	100		300					
Nail Pond							1					
Totals	820	4408	7144	1877	610	902	2324	2	5	234	230	497

[1]G. Hogan, PEI Fish and Wildlife Division, Maritime Nest Record Scheme, Canadian Wildlife Service, Sackville, N.B.; [2]MacDougall 1985; [3]Lock 1987

* Includes Great Black-backed Gulls

Table 4: Numbers of roosting gulls surveyed in Prince Edward Island away from colonies, recorded by Canadian Wildlife Service Coastal Survey Blocks.

Block	1986					1999					
	Great Black-backed Gull	Herring Gull	Ring-billed Gull	Immature	Total	Great Black-backed Gull	Herring Gull	Bonaparte's Gull	Immature	Unknown	Total
381	301	1271		235	**1807**					360	**360**
382	327	935		227	**1489**					365	**365**
383					**NS**					75	**75**
384					**NS**						**0**
385	59	699		26	**784**						**0**
386	42	691		800	**1533**					550	**550**
387	55	611		1095	**1761**					521	**521**
388	110	319		375	**804**					45	**45**
389	12	13		25	**50**		+				**+**
390	30	180		199	**409**		350				**350**
393	74	281	20	125	**500**	18	84		30	0	**132**
394	7	90	10	60	**167**	0	0		55	323	**378**
395	7	11	3	2	**23**	38	2				**40**
396	16	57		44	**117**						**0**
397		77		55	**132**				55	100	**155**
398		64		22	**86**	2	363	100	44	140	**649**
402	93	100		55	**248**		80		40	135	**255**
403	36	80		31	**147**	2	28		42		**72**
404	56	46		3	**105**	6	54				**60**
405		5			**5**				22		**22**
406		34			**34**	4	95		40		**139**
407	2	32			**34**		35				**35**
408					**0**	10	90				**100**
409	6				**6**						**NS**
411	5	413		7	**425**				70		**70**
412	66	165		78	**309**				50		**50**
413		109		4	**113**	3	79	0	12	55	**149**
414	145	159		61	**365**	0	230	0	0	2	**232**
415	7	37		16	**60**		90			28	**118**
416	49	155			**204**					12	**12**
417	24	85		2	**111**						**0**
418	116	747		27	**890**					550	**550**
Total	1645	7466	33	3574	**12718**	83	1580	100	460	3261	**5484**

+ present but not counted; NS not surveyed

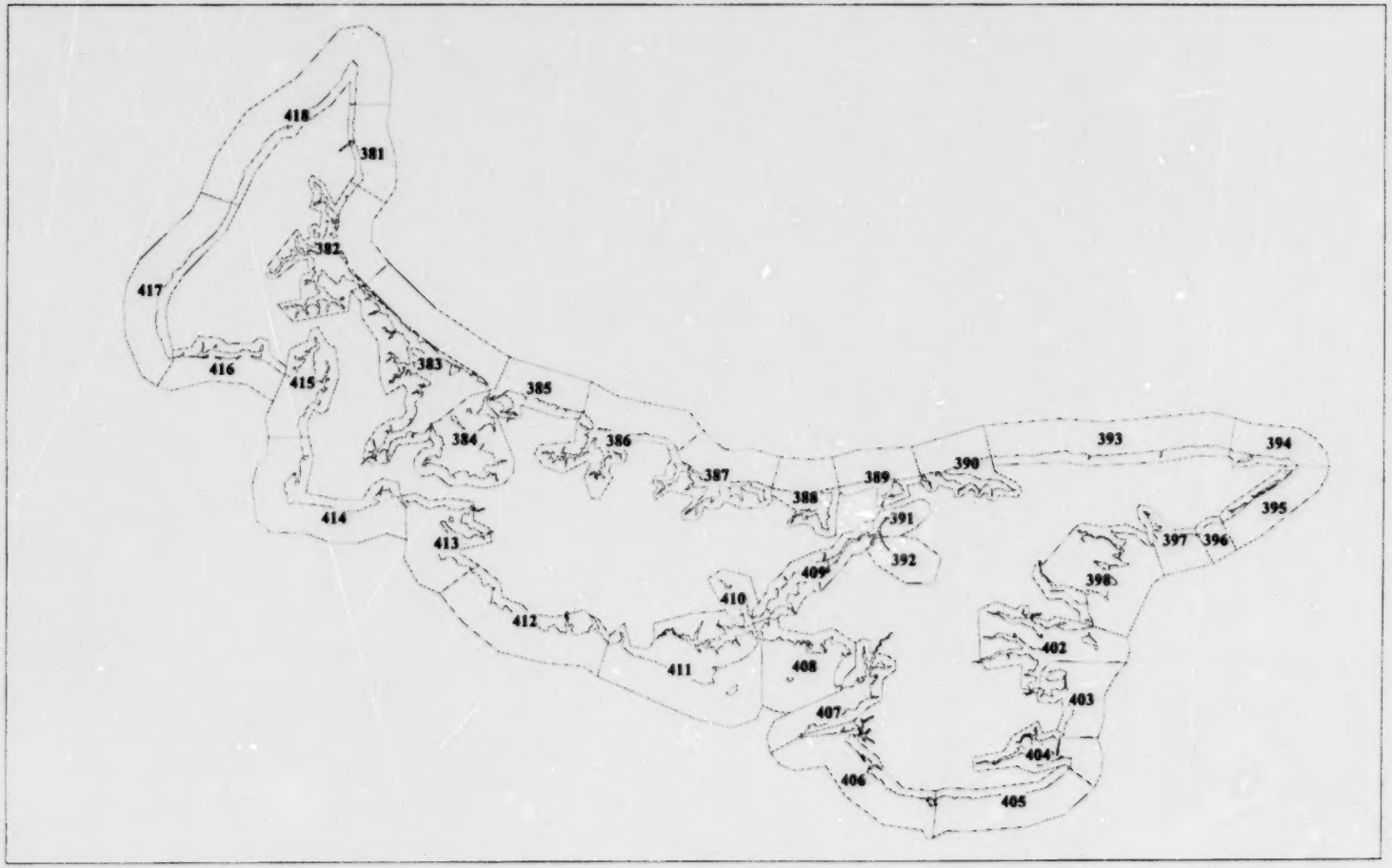


Figure 1: Location of Canadian Wildlife Service Coastal Survey Blocks in Prince Edward Island.

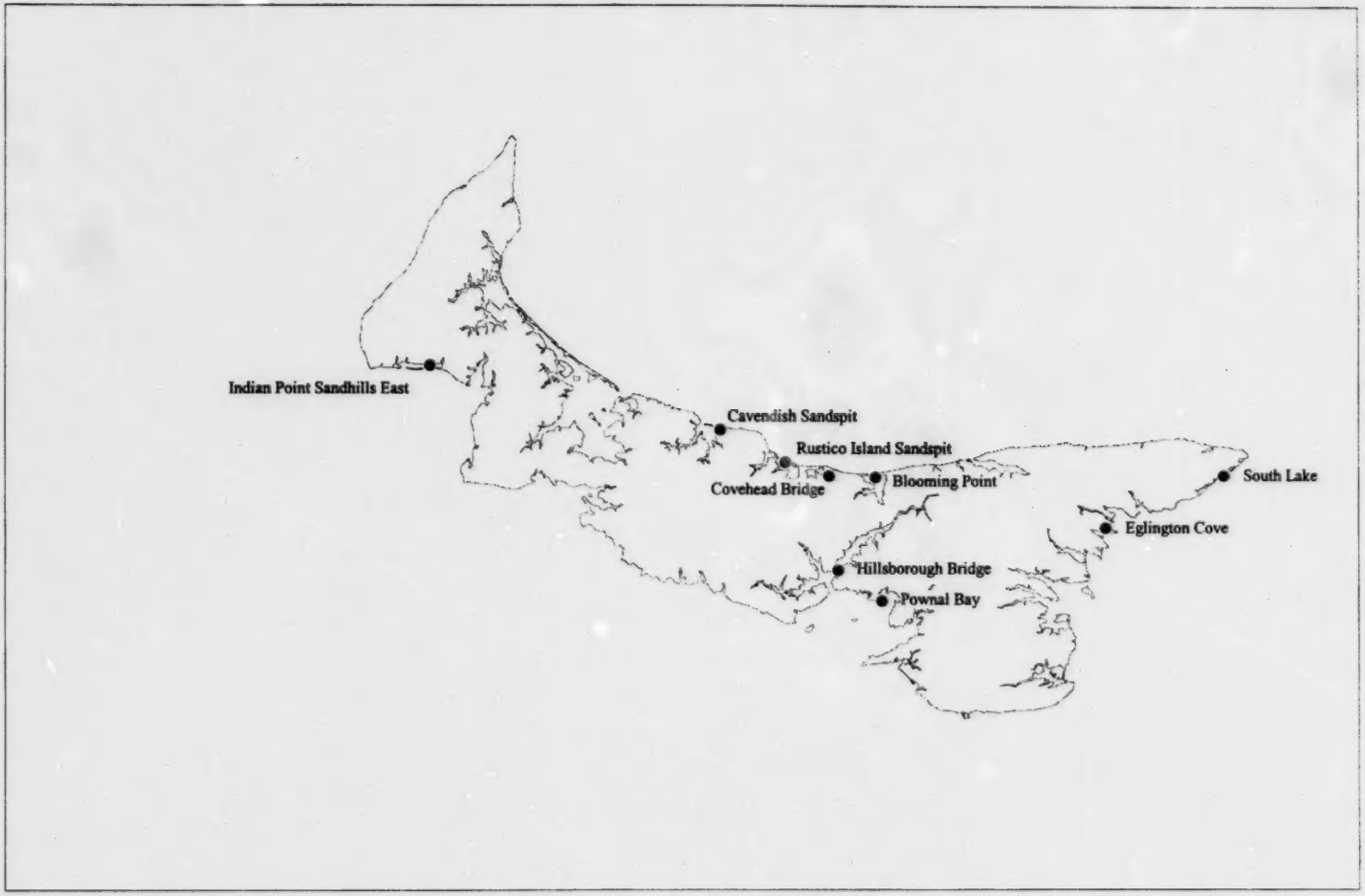


Figure 2: Location of breeding colonies of terns on Prince Edward Island, 1999.

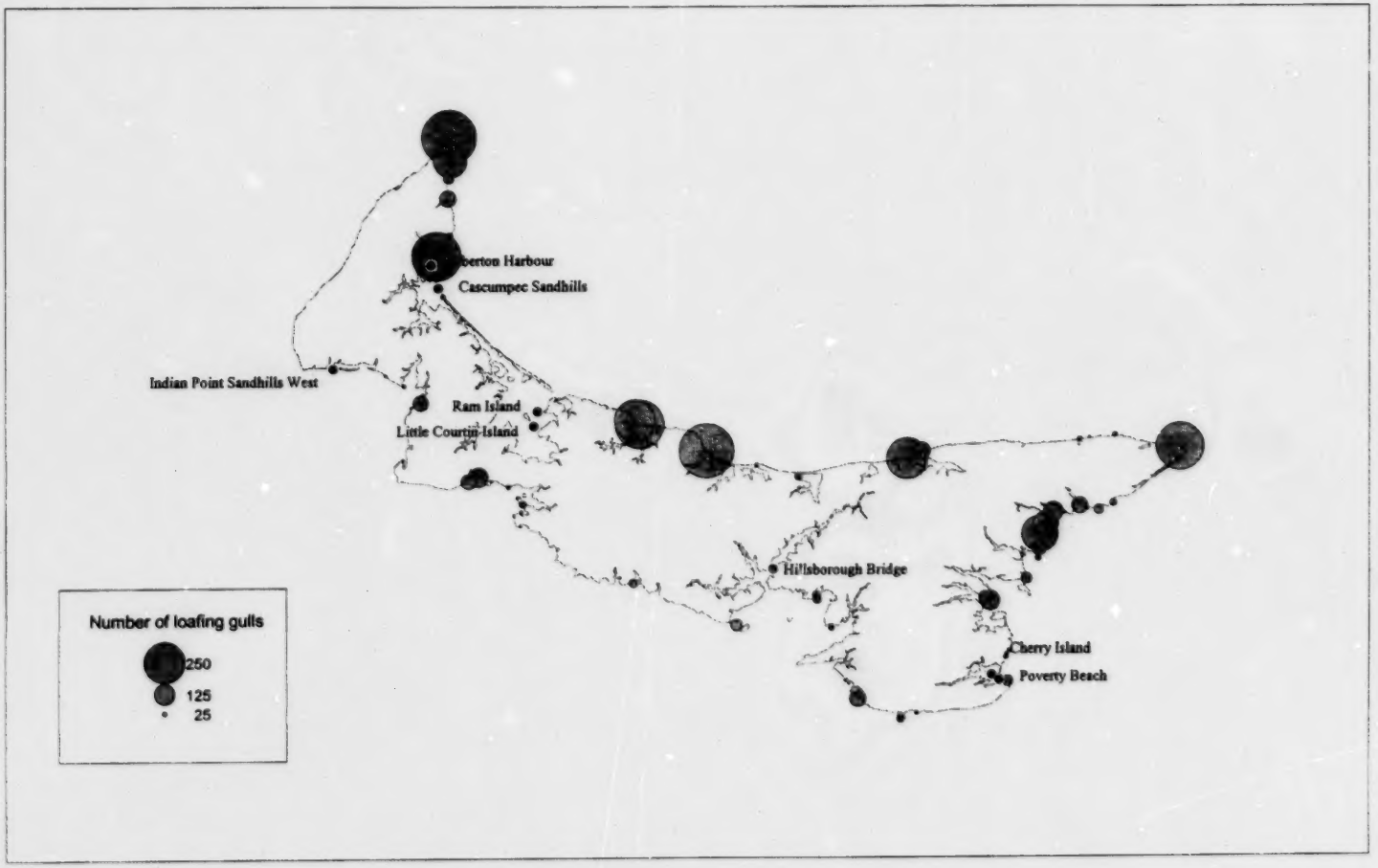


Figure 3: Location of breeding colonies and roosting flocks of gulls on Prince Edward Island, 1999

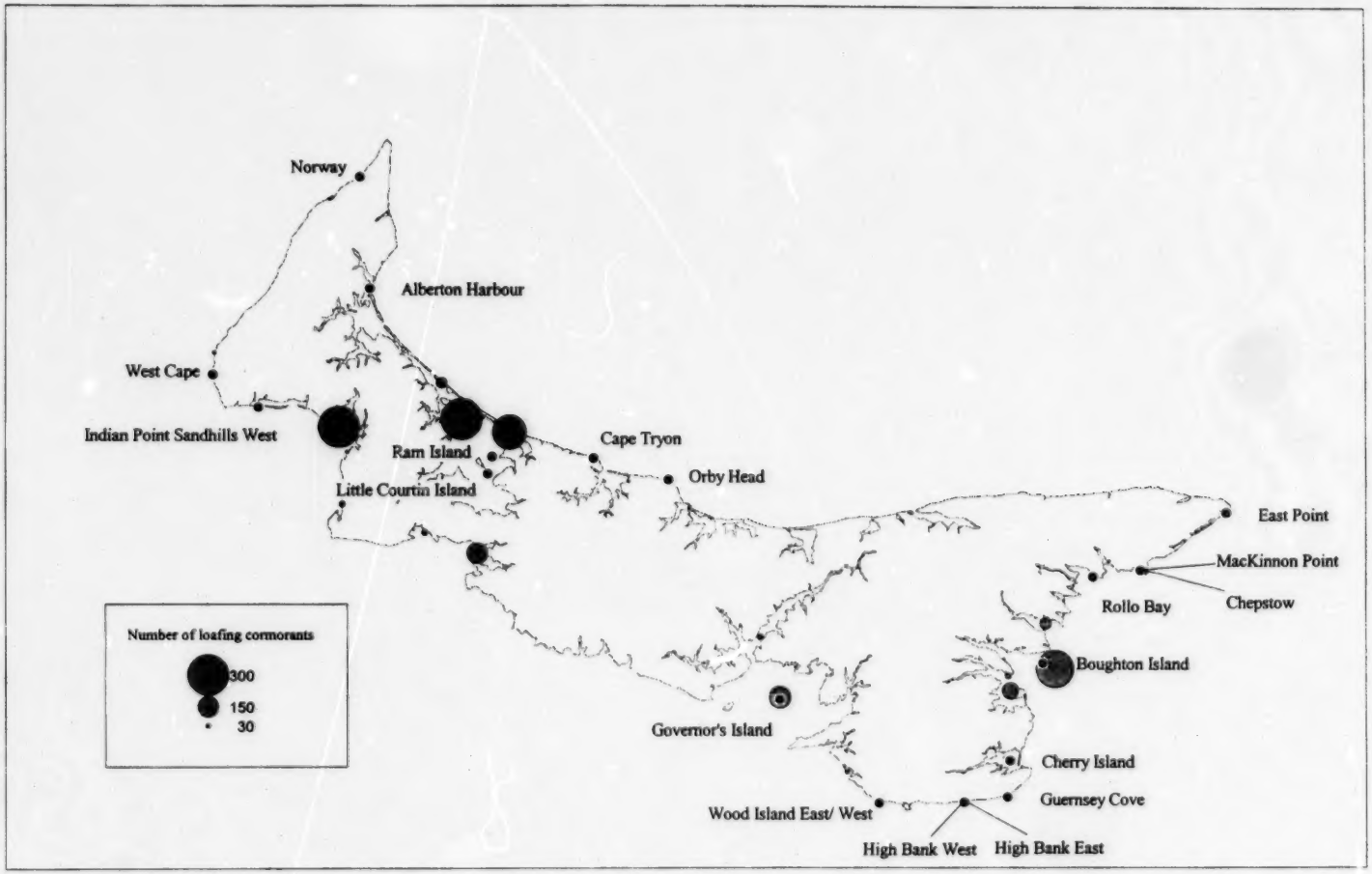


Figure 4: Location of breeding colonies and roosting flocks of cormorants on Prince Edward Island, 1999

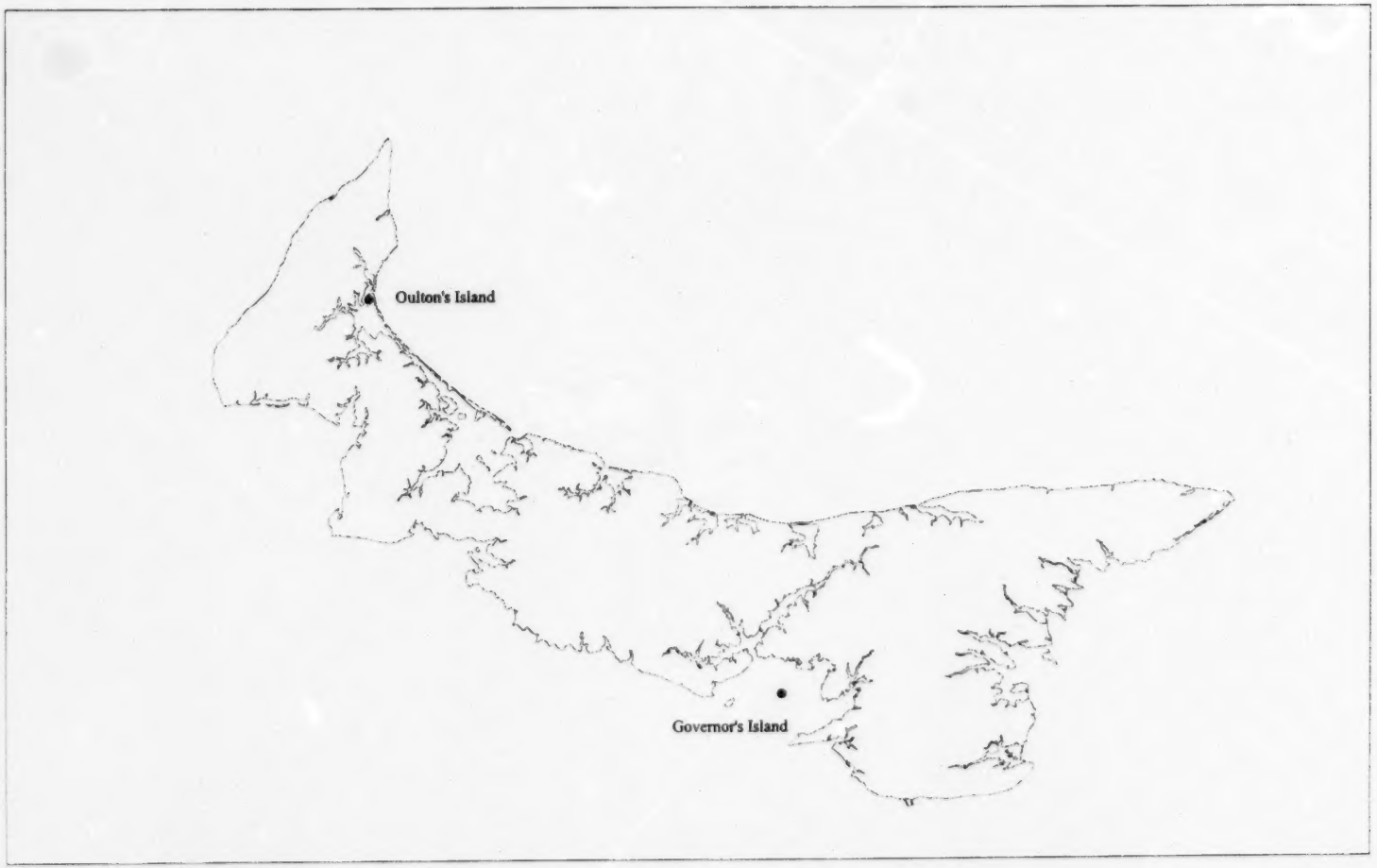


Figure 5: Location of breeding colonies of Great Blue Herons observed during aerial survey of coastal Prince Edward Island, 1999

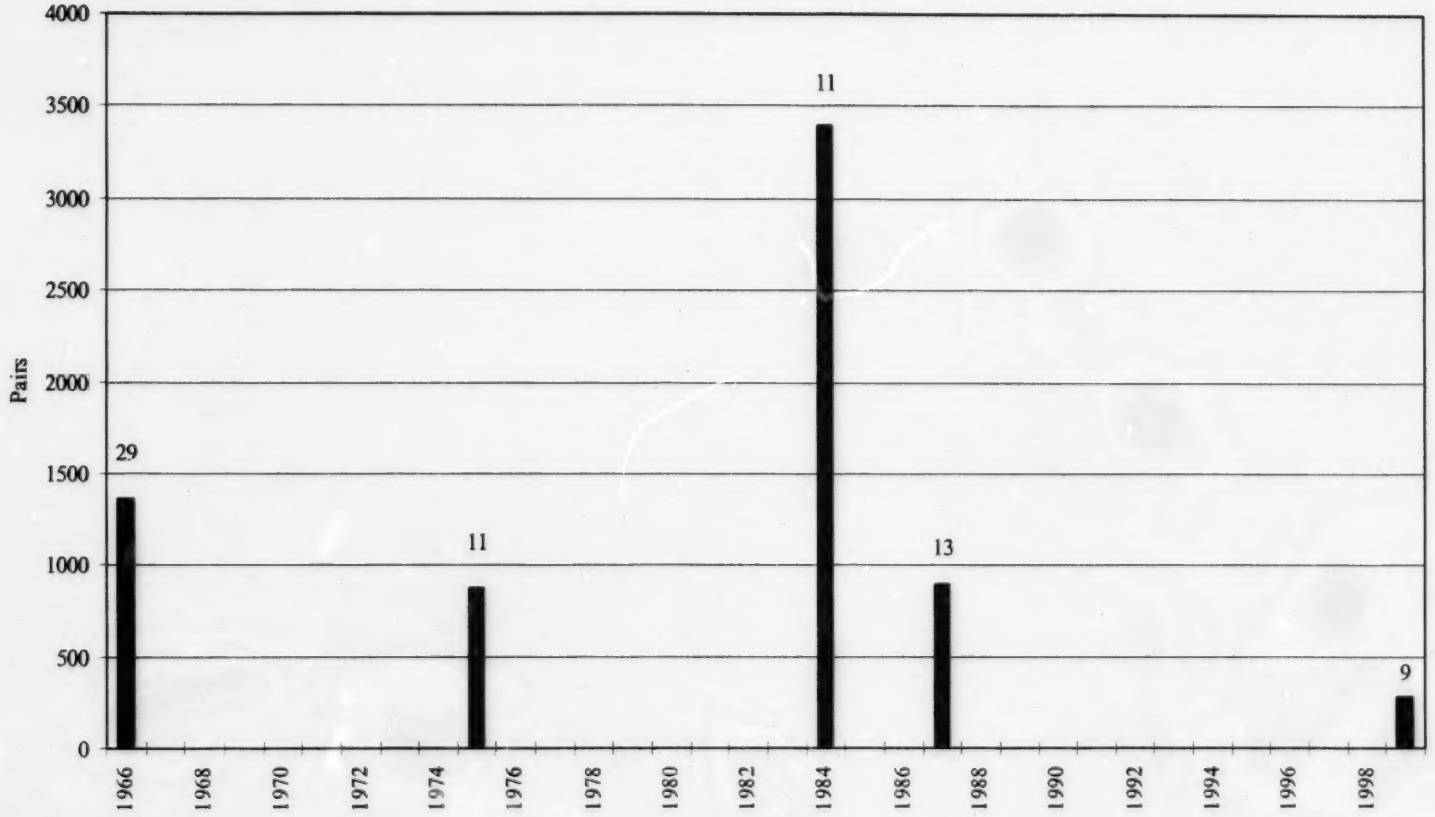


Figure 6: Pairs of terns surveyed in Prince Edward Island 1966, 1975, 1984, 1987, and 1999. Number of colonies is shown above columns.

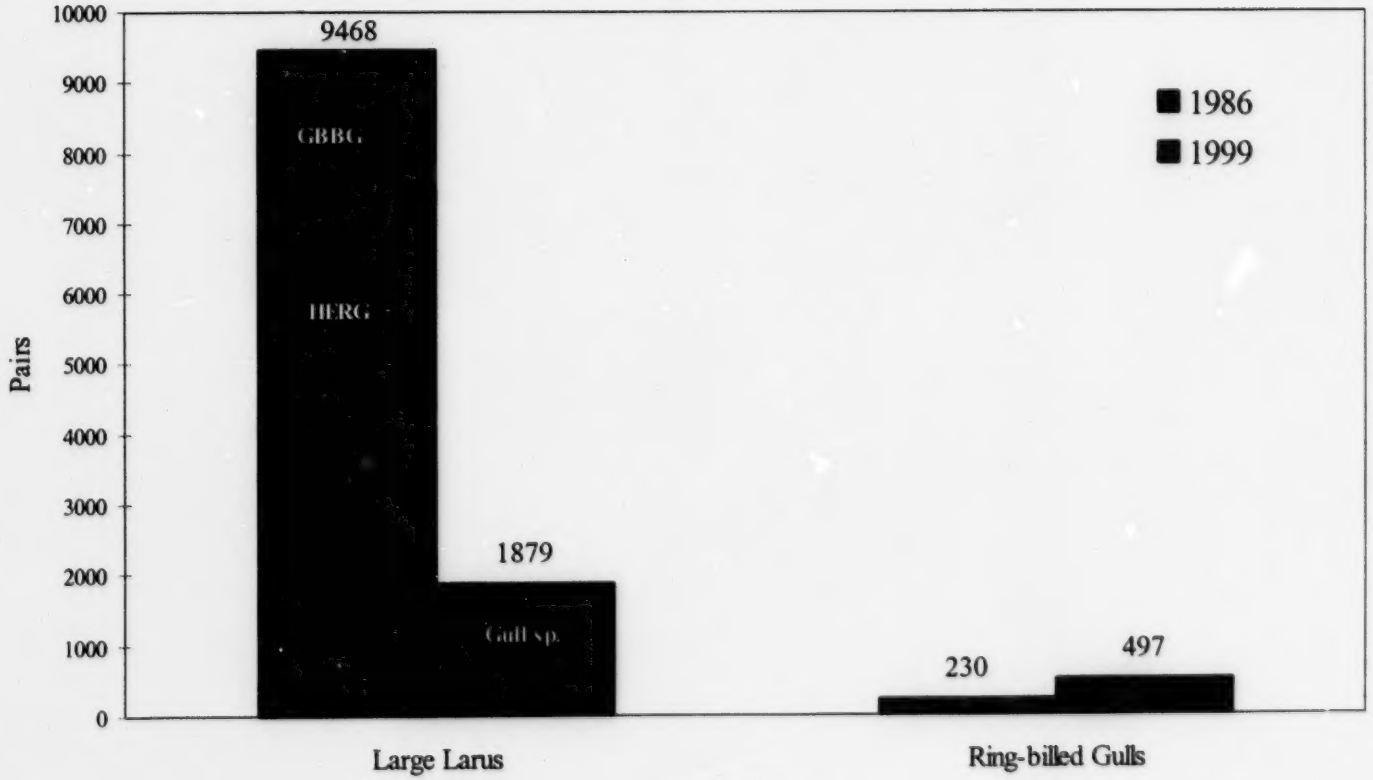
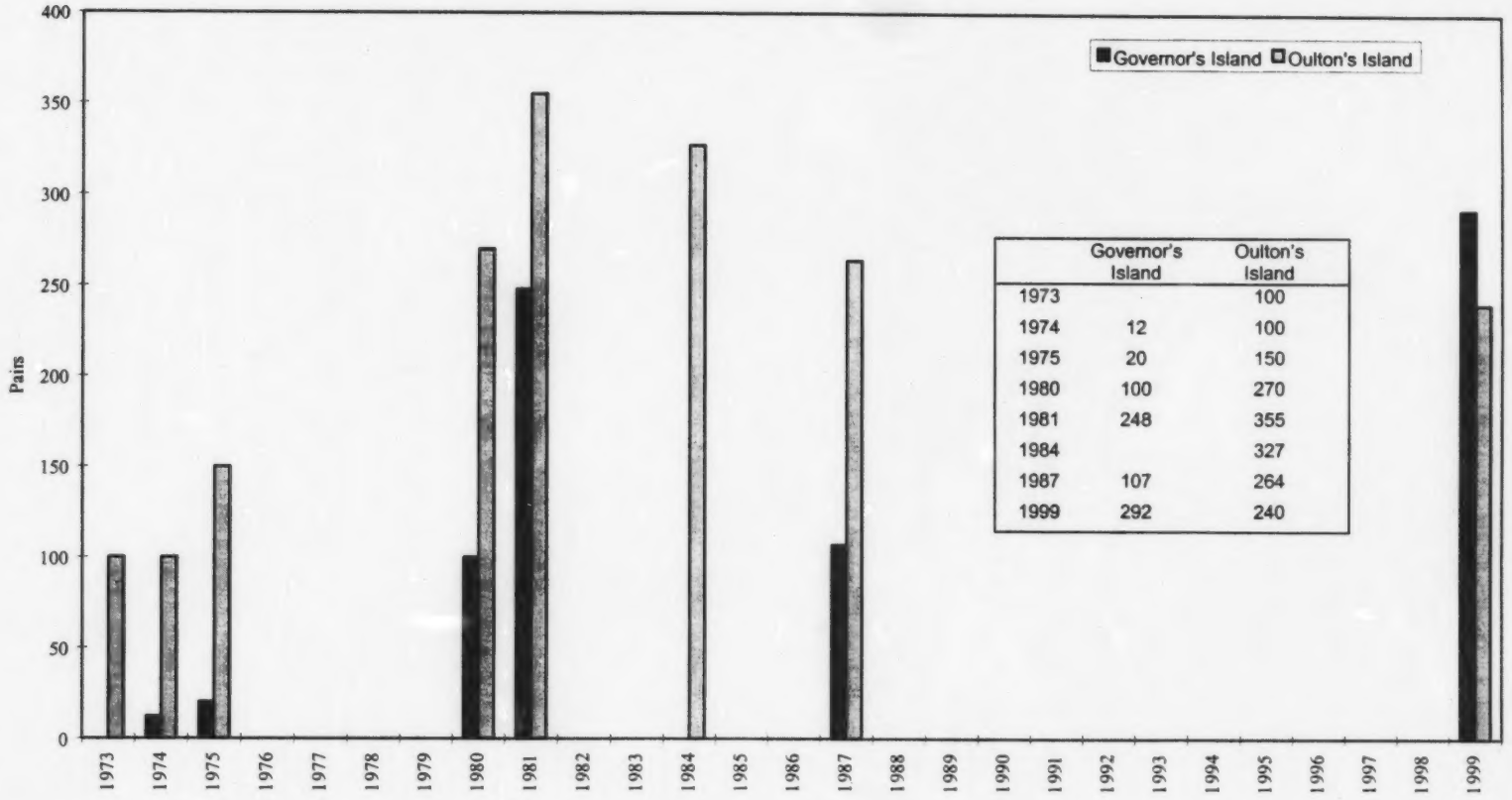


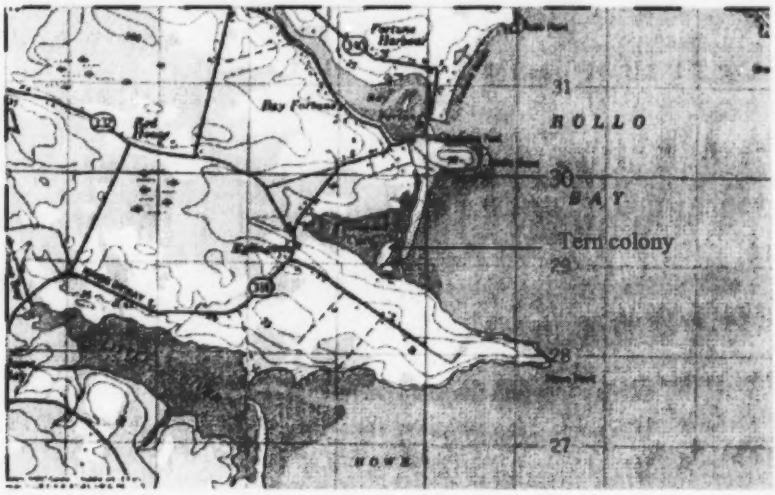
Figure 7: Pairs of gulls surveyed in Prince Edward Island 1986 and 1999. Number of pairs is shown above columns (HERG = Herring Gull; GBBG = Great Black-backed Gull).



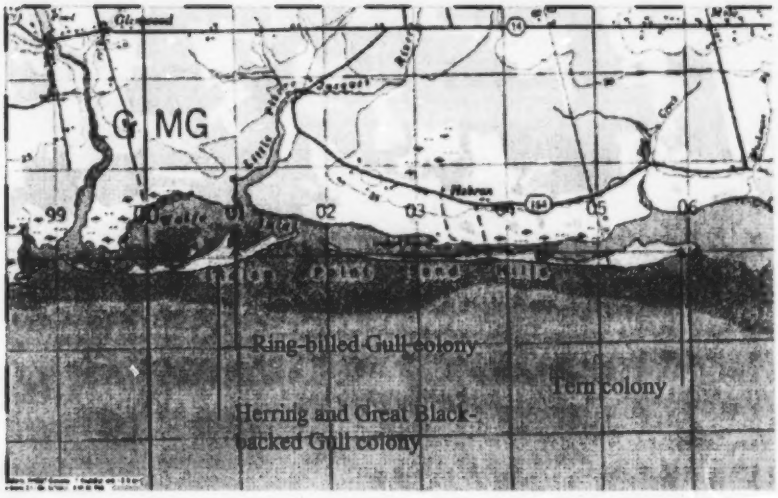
	Governor's Island	Oulton's Island
1973		100
1974	12	100
1975	20	150
1980	100	270
1981	248	355
1984		327
1987	107	264
1999	292	240

Figure 8: Pairs of Great Blue Herons surveyed on Oulton's and Governor's Island, Prince Edward Island, 1973-1999. Data from 1973 - 1987 was extracted from the Atlantic Region Seabird Colony Database, Canadian Wildlife Service, Sackville, NB.

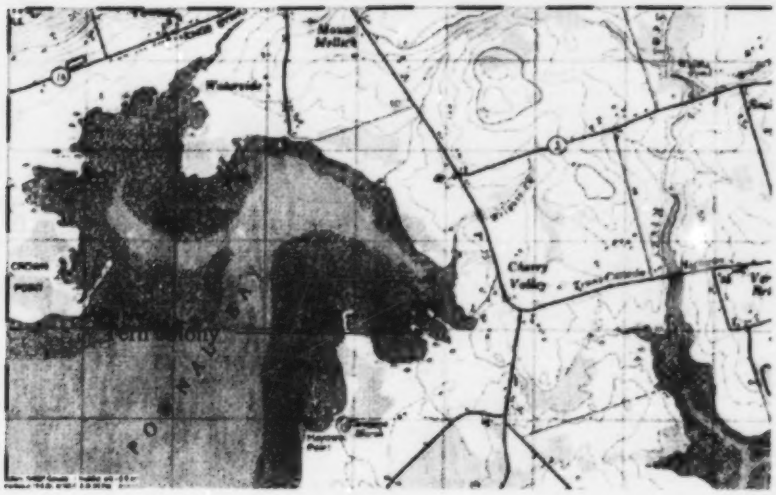
APPENDIX - 1:50,000 TOPOGRAPHIC MAPS FOR SELECTED COLONIES



Eglington Cove



Indian Point Sandhills, East and West



Pownal Bay, Jobs Point